

**Claims**

1. Input apparatus for a data processing system having the form of a fully enclosed substantially spherical object, including touch-sensing means for generating position signals indicative of the position of touched events occurring anywhere on the surface of the object;

orientation sensing means for identifying the orientation of the object;

processing means for combining touch data with orientation data;

and

transmitting means arranged to transmit processed data to a data processing system.

2. Apparatus according to claim 1, wherein said processed data represents said touch event signals orientated with respect to said display apparatus, by making reference to said orientation signals.

3. Apparatus according to claim 2, wherein said orientation sensing means includes an ambient magnetic field sensor.

4. Apparatus according to claim 3, wherein said magnetic field sensor comprises three mutually orthogonal magnetic field detectors.

5. Apparatus according to claim 2, wherein said orientation sensing means includes gravitational sensing means.

6. Apparatus according to claim 5, wherein said gravitational sensing means comprises

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a mobile inductor core in an enclosure, and  
three mutually orthogonal inductors responsive to the position of said  
mobile core.

5           7.    Apparatus according to claim 6, wherein a said inductor is  
included in an oscillating circuit.

8.    Apparatus according to claim 7, including counting means for  
measuring a frequency generated by said oscillating circuit

10           9.    Apparatus according to claim 6, including  
means for measuring an inductance of a said inductor,  
processing means for processing said measurement, wherein  
said processing means includes look-up means for identifying the  
15   orientation of said sphere with respect to gravity.

10.   Apparatus according to claim 1, wherein said sensing means  
comprises a plurality of sound transducer means.

20           11.   Apparatus according to claim 10, wherein said sphere has a  
surface that generates sound in response to a touch event.

12.   Apparatus according to claim 11, wherein said sound  
generating surface generates a noise-like sound in response to a dragging  
25   motion of a finger.

13.   Apparatus according to claim 11, wherein said sensing means

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comprises a plurality of microphones.

14. Apparatus according to claim 13, including processing means arranged to compare signals from said microphones in order to identify a characteristic of a touch event.

15. Apparatus according to claim 14, wherein said characteristic is a position.

16. Input apparatus for a computer with a graphic display means, having the form of a fully enclosed sphere, including

touch sensing means for generating position signals indicative of the position of touch events occurring anywhere on said spherical surface,

transmitting means arranged to transmit signals to a computer in response to said position signals,

orientation detecting means for detecting orientation of said sphere, and

processing means configured to combine signals from said touch sensing means and said orientation detecting means for subsequent identification of a touch event orientation substantially with respect to said graphic display means.

17. Apparatus according to claim 16, wherein said touch sensing means comprises a plurality of microphones and said sphere has a surface that generates sound in response to touch events.

18. Apparatus according to claim 17, wherein said sphere has a

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roughened surface.

**19.** Apparatus according to claim **16**, wherein said computer includes processing means configurable to perform steps of:

5        selecting a graphical or text mode for said sensor,  
      when in said graphical mode to perform steps for identifying a graphical instruction in response to touch events, and  
      when in said text mode to perform steps for identifying text in response to touch events.

10        **20.** Apparatus according to claim **16**, wherein said sensor includes rechargeable cell means and a recharging inductive loop means.

**21.** A method of generating control signals for a data processing systems displaying a graphical interface on a display apparatus, wherein

15        a sensor has a substantially spherical form and includes:  
      an outer surface and touch sensing means for generating position signals indicative of the position of touch events on said surface;

20        orientation sensing means for identifying orientation; and  
      transmitting means for transmitting sensed data to a data processing system, comprising steps of

      identifying the position of a touch event on the surface of said sensor;

25        identifying the orientation of said sensor; and  
      combining data representation position with data representing said orientation to generate such event signals orientated substantially with respect to display apparatus.

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22. A method according to claim 21, wherein said touch sensing means includes acoustic transducer means, and said position signals are generated by processing sound signals.

23. A method according to claim 22, wherein said sound processing includes frequency domain analysis.

24. A method according to claim 23, including identifying probable distances from sensors of a touch event in response to frequency characteristics of sounds at said sensors.

25. A method according to claim 24, wherein said distances are combined to identify a location.

26. A method according to claim 25, wherein additional processing of said signals is performed in order to reduce positional error.

27. A method according to claim 23, including measuring a time interval between the start of a sound at a plurality of acoustic transducer means.

28. A method according to claim 27, wherein said sound is generated in response to a hit event on the surface of said sphere.

29. A method according to claim 23, wherein frequency analysis is used to identify a characteristic of drag touch events and start-time

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analysis is used to identify a characteristic of hit touch events.

5       **30.**    A method of interacting with a three dimensional object model in a computer generated environment, wherein signals are supplied to said environment from a surface touch position sensitive sphere, comprising steps of:

          generating a mapping from said sphere to said object; and  
          receiving touch events from said sphere and interpreting them to interact with a respective surface portion of said object.

10       **31.**    A method of modifying a three dimensional object model in a computer generated environment, wherein signals are supplied to said environment from a surface touch position sensitive sphere, comprising steps of:

15       generating a mapping from said sphere to said object;  
          receiving touch events from said sphere and interpreting them to manipulate a respective surface portion of said object;  
          updating said object; and  
          generating a new mapping from said sphere to said object.

20       **32.**    A method of generating positional input signals for a computer, in which the position of an interaction between a moving object and a surface is identified by an analysis of the sound generated by friction between said surface and said object.

25       **33.**    A method according to claim **32**, wherein said object is a computer user's finger.

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34. A method of supplying positional information to a computer, in which the position of an interaction between a user's finger and a surface generates sound by friction between said surface and said finger;

5        said sound is converted into an electrical signal by acoustic transducer means; and

      signals derived from said sound are transmitted to a computer such that the position of said interaction controls a position characteristic in an environment generated by said computer.

10        35. Apparatus substantially as herein described with reference to Figures 1, 2, 3 and 4.

15        36. A method substantially as herein described with reference to Figures 1, 2, 3 and 4.

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